

WEST

☐ Generate Collection

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TITLE: Method and apparatus for pre-processing and packaging class files

Brief Summary Text (19):

A Java program is composed of a number of classes and interfaces. Unlike many programming languages, in which a program is compiled into machine-dependent, executable program code, Java classes are compiled into machine independent bytecode class files. Each class contains code and data in a platform-independent format called the class file format. The computer system acting as the execution vehicle contains a program called a virtual machine, which is responsible for executing the code in Java classes. The virtual machine provides a level of abstraction between the machine independence of the bytecode classes and the machine-dependent instruction set of the underlying computer hardware. A "class loader" within the virtual machine is responsible for loading the bytecode class files as needed, and either an interpreter executes the bytecodes directly, or a "just-in-time" (JIT) compiler transforms the bytecodes into machine code, so that they can be executed by the processor. FIG. 1 is a block diagram illustrating a sample Java network environment comprising a client platform 102 coupled over a network 101 to a server 100 for the purpose of accessing Java class files for execution of a Java application or applet.

Brief Summary Text (21):

In FIG. 1, server 100 comprises Java development environment 104 for use in creating the Java class files for a given application. The Java development environment 104 provides a mechanism, such as an editor and an applet viewer, for generating class files and previewing applets. A set of Java core classes 103 comprise a library of Java classes that can be referenced by source files containing other/new Java classes. From Java development environment 104, one or more Java source files 105 are generated. Java source files 105 contain the programmer readable class definitions, including data structures, method implementations and references to other classes. Java source files 105 are provided to Java compiler 106, which compiles Java source files 105 into compiled "class" files 107 that contain bytecodes executable by a Java virtual machine. Bytecode class files 107 are stored (e.g., in temporary or permanent storage) on server 100, and are available for download over network 101.

Brief Summary Text (23):

Java class files are often identified in applet tags within an HTML (hypertext markup language) document. A web server application 108 is executed on server 100 to respond to HTTP (hypertext transport protocol) requests containing URLs (universal resource locators) to HTML documents, also referred to as "web pages." When a browser application executing on client platform 102 requests an HTML document, such as by forwarding URL 109 to web server 108, the browser automatically initiates the download of the class files 107 identified in the applet tag of the HTML document. Class files 107 are typically downloaded from the server and loaded into virtual machine 111 individually as needed.

Brief Summary Text (27):

A further disadvantage of the individual class loading process is that the computer executing the Java program must remain physically connected to the source of Java classes during the duration of the program's execution. This is a problem especially for mobile or embedded computers without local disk storage or dedicated network access. If the physical connection is disrupted during execution of a Java application, class files will be inaccessible and the application will fail when a new class is needed. Also, it is often the case that physical connections to

networks such as the Internet have a cost associated with the duration of such a connection. Therefore, in addition to the inconvenience associated with maintaining a connection throughout application execution, there is added cost to the user as a result of the physical connection.

Brief Summary Text (28):

A Java archive (JAR) format has been developed to group class files together in a single transportable package known as a JAR file. JAR files encapsulate Java classes in archived, compressed format. A JAR file can be identified in an HTML document within an applet tag. When a browser application reads the HTML document and finds the applet tag, the JAR file is downloaded to the client computer and decompressed. Thus, a group of class files may be downloaded from a server to a client in one download transaction. After downloading and decompressing, the archived class files are available on the client system for individual loading as needed in accordance with standard class loading procedures. The archived class files remain subject to storage inefficiencies due to duplicated data between files, as well as memory fragmentation due to the performance of separate memory allocations for each class file.

Detailed Description Text (13):

Embodiments of the invention can be better understood with reference to aspects of the class file format. Description is provided below of the Java class file format. Also, enclosed as Section A of this specification are Chapter 4, "The class File Format," and Chapter 5, "Constant Pool Resolution," of The Java Virtual Machine Specification, by Tim Lindholm and Frank Yellin, published by Addison-Wesley in September 1996, .COPYRGT.Sun Microsystems, Inc.

Detailed Description Text (14):

The Java class file consists of a stream of 8-bit bytes, with 16-bit, 32-bit and 64-bit structures constructed from consecutive 8-bit bytes. A single class or interface file structure is contained in the class file. This class file structure appears as follows:

Detailed Description Text (17):

Magic value 301 contains a number identifying the class file format. For the Java class file format, the magic number has the value 0.times.CAFEBABE. The minor version number 302 and major version number 303 specify the minor and major version numbers of the compiler responsible for producing the class file.